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**UK Patent Application GB 2 330 772 A**

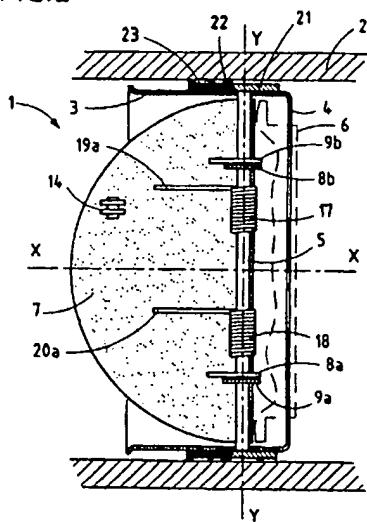
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(54) Abstract Title  
**Ventilation duct shutter**

(57) A fire shutter 1 for a ventilation duct 2 has an insertion tube 3 with an inwardly-directed rim 4 at one end, two flaps 6, 7 in the form of wings pivotally mounted on a rod 5 extending perpendicularly to the axis X of the tube 3, and means 14 including a fusible element and serving to retain the flaps 6, 7 parallel to the axis X in the open position against two springs 17, 18. If the fusible element melts, the springs deploy the flaps into a closure plane. The flaps 6, 7 include an overlap region 10, 11 in the middle thereof. The springs press against regions close to the peripheries of the flaps.

**FIG.2**



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FIG. 1

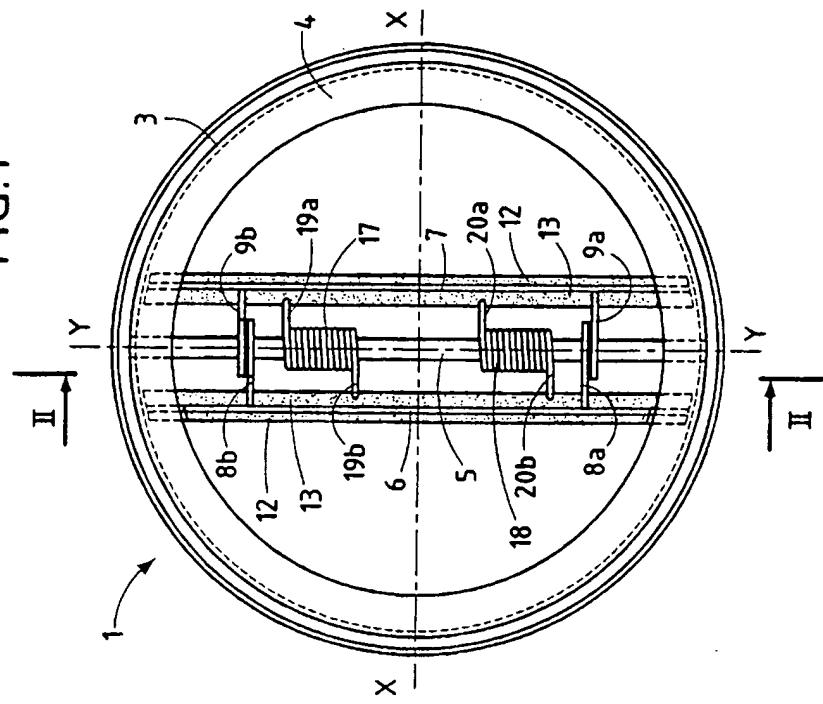


FIG. 2

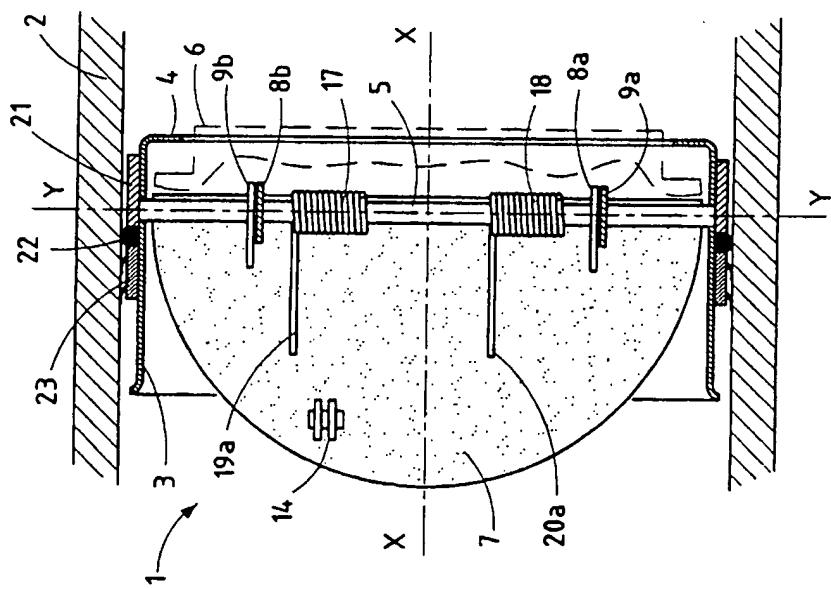
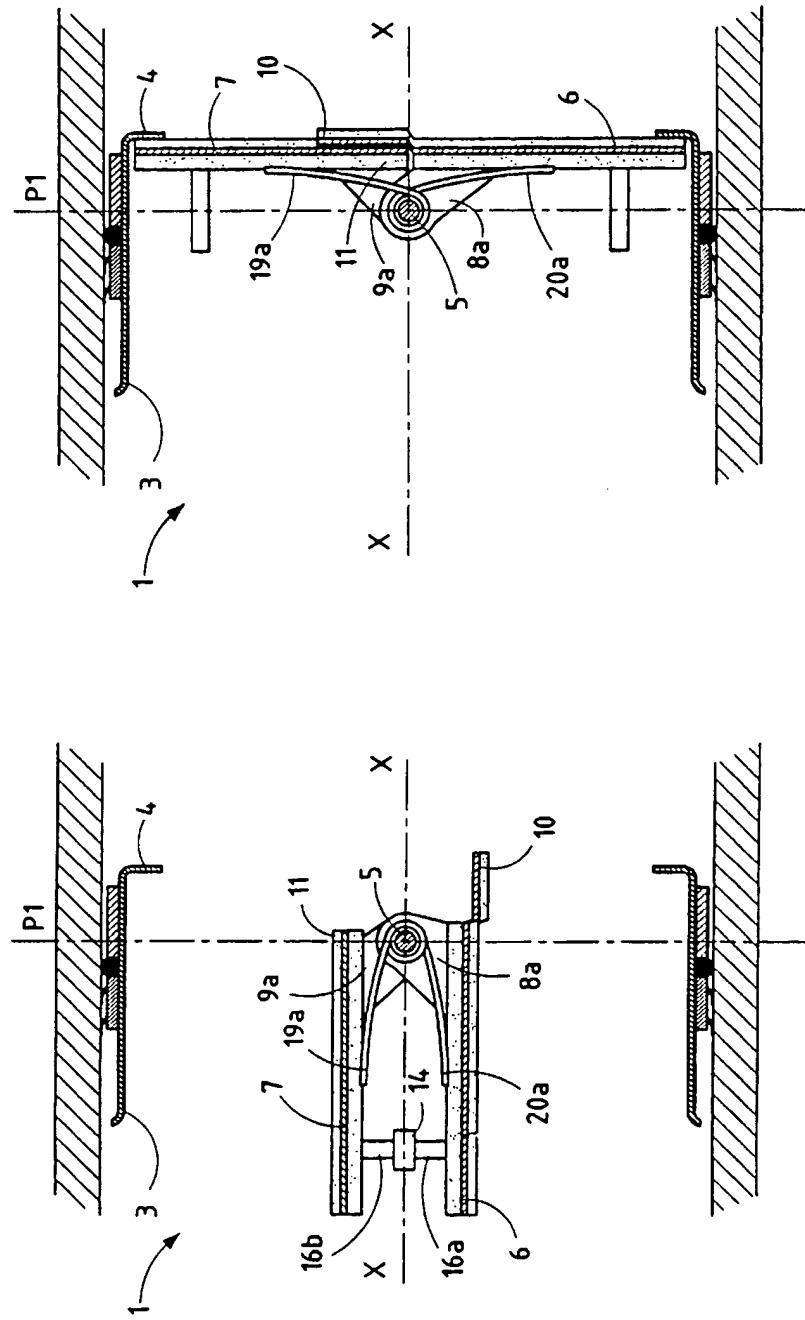


FIG.3  
FIG.4



## A FIRE-BRAKE SHUTTER FOR A VENTILATION DUCT

The present invention relates to the field of fire-brake or flame-brake devices provided in air flow installations.

5 More particularly, the invention relates to a fire-brake shutter designed to be installed in a ventilation duct and comprising:

• an insertion tube of axis X which fits in said duct;

10 • two wing-shaped flaps pivotally mounted on a rod carried by the insertion tube and defining an axis of rotation Y perpendicular to the axis X and parallel to central rims of said two flaps, the two flaps being suitable for taking up an open position in which they are held in planes parallel to the axis X and to the axis of rotation Y, and a closed position in which they are deployed into a plane perpendicular to the axis X, thereby closing the insertion tube;

15 • holding means for holding the two flaps in the open position, said holding means including a fusible element suitable for melting at a determined temperature to release said holding elements;

20 • resilient means pressing against the flaps and designed to urge the flaps towards the closed position when the fusible element melts; and

25 • an abutment wall provided inside the tube and against which the peripheral rims of the flaps press when in the closed position.

Such shutters are installed, in particular, in ventilation ducts that pass through walls. Their function is to isolate premises in the event of a fire so as to prevent the fire propagating to adjacent premises. When gas leaving the premises where there is a fire via such ducts reaches a predetermined temperature, the 35 fusible element melts and the flaps deploy under drive from the resilient elements and they close the insertion tube. In general, the flaps are covered in insulating

materials that withstand heat, thereby enabling the fire-brake device to perform its function of isolating the premises safely for a certain length of time, until the emergency services have taken action.

5        In general, ventilation ducts in a building are connected to a suction device. If there is a fire in one of the premises, its fire-brake shutter must isolate the premises effectively so as to comply with present safety standards. When the flaps are in the closed position, 10 sealing must be perfect between the abutment wall and the peripheral rims of the flaps, and also between the central rims of the flaps, which in most presently-known devices are juxtaposed when the flaps are in the closed position. Present standards require this sealing to be 15 guaranteed for a certain length of time even if the suction generated by the suction device is as great as 150 Pascals.

20        The object of the invention is to provide improvements to fire-brake shutters that enable those safety criteria to be met.

25        The invention achieves its object by the following set of dispositions:

• the resilient means comprise at least two coil springs surrounding said rod and having end branches 30 permanently pressing against the flaps in regions remote from the rod;

• the abutment wall is constituted by an annular rim provided at one end of the insertion tube and which extends perpendicularly to the axis X towards the inside 35 of said tube; and

• adjacent to its rectilinear edge, one of the flaps has an overlap region which covers a portion of the second flap when in the closed position.

35        The invention also proposes improving sealing in the annular space between the insertion tube and the inside wall of the ventilation duct.

To this end, the insertion tube includes sealing means suitable for co-operating with the ventilation duct.

Advantageously, the sealing means include at least 5 one annular ring of intumescent material surrounding the insertion tube and secured thereto.

The sealing means may also comprise at least one elastomer ring, and preferably two elastomer rings.

Other advantages and characteristics of the 10 invention appear on reading the following description given by way of example and made with reference to the accompanying drawings, in which:

• Figure 1 is a face view of the fire-brake shutter of the invention with its flaps in their open position;

15 • Figure 2 is a section on line II-II of Figure 1;

• Figure 3 is a section in an axial plane perpendicular to the pivot axis of the flaps and showing the flaps in the open position; and

20 • Figure 4 is similar to Figure 3 but showing the flaps in the closed position.

The drawings show a fire-brake shutter 1 of axis X that is designed to be inserted into a tubular duct 2 in a ventilation circuit, likewise of axis X.

The shutter 1 comprises an insertion tube 3 having, 25 at one end, an annular rim 4 extending perpendicularly to the axis X towards the inside of the tube 3. A rod 5, extending perpendicularly to the axis X, is mounted in the insertion tube 3. The center of the rod 5 intersects the axis X.

30 Two flaps 6 and 7 in the form of semicircular wings are pivotally mounted on the rod 5 by means of tabs 8a and 8b for the flap 6 and tabs 9a and 9b for the flap 7. The rod 5 defines a pivot axis Y for the flaps 6 and 7. The tabs 8a & 8b and 9a & 9b extend perpendicularly to 35 the planes of the flaps 6 and 7 and are disposed in the vicinity of respective middle rectilinear rims 10 and 11 of the flaps 6 and 7. The rod 5 passes through orifices

formed in the tabs 8a, 8b, 9a, and 9b, and is parallel to the planes of the flaps 6 and 7.

The faces of the two flaps 6 and 7 are covered in layers 12 and 13 of insulating material that withstands fire.

5 The two flaps 6 and 7 can take up two extreme positions. In the normal operating position, which is the open position for the shutter 1, the two flaps are folded into planes that are parallel to the axes X and Y so as to allow ambient air to flow freely through the 10 insertion tube 3.

15 In the closed position, the two flaps 6 and 7 are deployed in a plane P1 perpendicular to the axis X and adjacent to the plane of the rim 4 so that the periphery of the flaps 6 and 7 bears against the inside face of the rim 4, thereby providing sealing at the rim.

20 The flaps 6 and 7 are held in the open position by conventional holding means 14 which include, in particular, a fusible element that is designed to melt at a determined temperature so as to release the holding means 14. The holding means can be fixed on hooks 16a and 16b fitted to the flaps 6 and 7.

25 Two spaced-apart coil springs 17 and 18 with their turns surrounding the rod 5 have respective end branches 19a & 19b and 20a & 20b which press against the inside faces of the flaps 6 and 7 close to the peripheries of said flaps in zones that are remote from the rod 5.

30 In the open position, the holding means 14 retain the flaps 6 and 7 against the forces exerted by the end branches of the springs 17 and 18. In the event of the fusible element of the holding means 14 melting, the end branches 19a & 19b and 20a & 20b cause the flaps 6 and 7 to deploy into the plane P1, and they continue to exert a positive force on the peripheries of the flaps 6 and 7 in the closed position.

35 To this end, the positions of the bearing points where the end branches 19a & 19b and 20a & 20b of the two

coil springs press against the inside faces of the flaps 6 and 7 are preferably uniformly distributed over the peripheries of the flaps 6 and 7 about the rod 5. These bearing points are remote from the rod 5 and close to the 5 peripheries of the flaps 6 and 7, and they are at a distance from the midplane perpendicular to the axis Y of the rod 5. The distance between two branches disposed on the same flap i.e. 19a & 20a or 19b & 20b is substantially equal to or slightly less than the radius 10 of the insertion tube 3. It has been observed that the presence of two coil springs disposed as described above considerably improves sealing after the shutter has been exposed to heat due to a fire, compared with conventional shutters that have a single spring only exerting forces 15 in the middle regions of the flaps.

As can be seen in Figures 3 and 4, the two flaps 6 and 7 are not identical. The middle rim 10 of the flap 6 extends further than the middle rim 11 of the flap 7, such that the middle rim 10 which is connected to the 20 remainder of the flap 6 by a pair of bends overlies the middle rim 10 of the flap 7 when the shutter is in the closed position as shown in Figure 4.

By means of this disposition and because the springs 17 and 18 act in regions that are remote from the rod 5, 25 when the shutter is in its closed position, sealing is provided against hot gases both around the periphery of the flaps 6 and 7 and also in the middle region thereof. It should be observed that the faces of the flaps 6 and 7 which bear against the rim 4 are generally their faces 30 that look towards the premises against which protection is to be provided. The force of the springs 18 and 19 and the positions of their bearing points against the inside faces of the flaps 6 and 7 make it possible to guarantee that the shutter provides perfect sealing, even 35 if the suction downstream is 150 Pascals.

Sealing between the insertion tube 3 and the duct 2 is preferably provided by means of three sealing rings

disposed in succession around the outside of the insertion tube. The ring 21, made of intumescant material, which is fixed to the insertion tube 3 can withstand temperatures in excess of 1000°C and at 125°C it reacts by swelling. The second sealing ring 22 is an elastomer O-ring which provides sealing in the temperature range 120°C to 800°C. The third ring 23 is an elastomer gasket which includes one or more lips and which provides cold sealing up to temperatures which may lie in the range 120°C to 150°C.

## CLAIMS

1/ A fire-brake shutter designed to be installed in a ventilation duct (2) and comprising:

5       • an insertion tube (3) of axis X which fits in said duct (2);

10      • two wing-shaped flaps pivotally mounted on a rod (5) carried by the insertion tube (3) and defining an axis of rotation Y perpendicular to the axis X and parallel to central rims (10, 11) of said two flaps (6, 7), the two flaps (6, 7) being suitable for taking up an open position in which they are held in planes parallel to the axis X and to the axis of rotation Y, and a closed position in which they are deployed into a plane (P1) perpendicular to the axis X, thereby closing the

15      insertion tube (3);

20      • holding means (14) for holding the two flaps in the open position, said holding means including a fusible element suitable for melting at a determined temperature to release said holding elements;

25      • resilient means (18, 19) pressing against the flaps (6, 7) and designed to urge the flaps towards the closed position when the fusible element melts; and

30      • an abutment wall (4) provided inside the tube (3) and against which the peripheral rims of the flaps press when in the closed position, the shutter being characterized by the fact that:

35      • the resilient means comprise at least two coil springs (18, 19) surrounding said rod (5) and having end branches (19a & 19b, 20a & 20b) permanently pressing against the flaps (6, 7) in regions remote from the rod (5);

40      • the abutment wall (4) is constituted by an annular rim provided at one end of the insertion tube (3) and which extends perpendicularly to the axis X towards the inside of said tube; and

- adjacent to its rectilinear edge, one of the flaps (6) has an overlap region (10) which covers a portion (11) of the second flap (7) when in the closed position.

5 2/ A fire-brake shutter according to claim 1,  
characterized by the fact that the insertion tube (3)  
also includes sealing means suitable for co-operating  
with the ventilation duct.

10 3/ A fire-brake shutter according to claim 2,  
characterized by the fact that the sealing means include  
at least one annular ring (21) of intumescent material  
surrounding the insertion tube (3) and secured thereto.

15 4/ A fire-brake shutter according to claim 2,  
characterized by the fact that the sealing means comprise  
at least one elastomer ring (22, 23).

20 5/ A fire-brake shutter according to claim 4,  
characterized by the fact that the sealing means comprise  
at least two elastomer rings (22, 23).

25 6/ A shutter according to claim 4 or 5, characterized by  
the fact that the sealing means further comprise an  
annular ring (21) of intumescent material surrounding the  
insertion tube (3) and secured thereto.



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Claims searched: All

Examiner: Michael R. Wendt  
Date of search: 13 January 1999

**Patents Act 1977**  
**Search Report under Section 17**

**Databases searched:**

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK CI (Ed.Q): A5A (A22, A23)

Int CI (Ed.6): A62C 2/14, 2/24, 3/14

Other: WPI, Claims

**Documents considered to be relevant:**

Category	Identity of document and relevant passage	Relevant to claims
X	GB 2230951 A (NAILOR-HART) e.g. see Figures 1 & 3. Page 5 lines 5 etc.	1
X	US 4474167 (McCabe) e.g. see Figure 1. Column 4 lines 35 etc.	---
A	US 4467824 (STRULIK) e.g. see Abstract. Column 3 lines 19 etc.	---

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
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